BANDSAW MANUAL

FOR MINIMAX 16 and 20

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Note: This manual has been assembled by Art Liebeskind from information and invaluable help from Bill Sams, Carl Knapp, Erik Delaney and many hints from others on the MiniMax Forum Users Group. Please use care and discretion and realize that all adjustments and operations are done at your own risk. Neither MiniMax nor the authors accept any responsibility for problems resulting from the operations of or adjustments to your bandsaw.

Feb 17,2004

MiniMax Bandsaw User's Manual For MM 16 & 20

DELIVERY UNCRATING AND INSPECTION

Delivery

You have made the right decision and now you are anxiously awaiting delivery. Right now, call the trucking company and make arrangements to get the machine into your shop. There are a number of options including :

- self pick up at the terminal,
- lift gate truck delivery to your location
- or even the use of a machine rigger who will pick up the saw and place it at the point of use in your shop

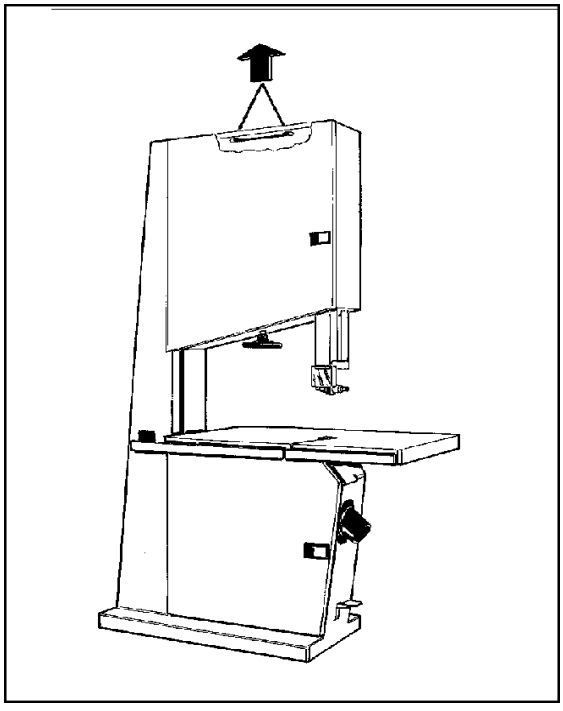

Fig 1 Hoist Holes

If you want to move the pallet you may of course use a simple pallet jack, a forklift (if you are fortunate enough to have the use of one), or the unit may be lifted and moved by a hoist connected to the lift holes at the top of the saw. *See Figure 1 Hoist Holes, at right*. Lifting is done by passing a rope through the holes in the top of the machine. On completing the operation, close the above mentioned holes with the plastic caps provided.
At any rate in addition to moving and lifting tackle, have refreshments and one or more strong friends on hand since the saw weighs about 450 pounds. The Saw will be crated and shrink wrapped on a pallet as seen below in Figure 2 Crated Saw. Obviously this packaging must be removed in order to check the condition of the sawand continue with the commissioning process.

Inspection and Uncrating

Your Mini Max Bandsaw is heavily built but it is not immune to shipping damage. Please inspect your saw thoroughly before signing for the machine! Inspect the crate, pallet and the actual machine for any dings, dents or crate damage. If you see anything, do not sign the delivery receipt and call Mini Max immediately at this toll free number (866-975-9663)!

Fig 2 Crated Saw

If you have access to a camera, photo evidence is extremely helpful. Pull out the packing list and check to see that all of your accessories are there. Confirm that if there are accessories missing,this fact shows as a back order notation on the packing list.

Now that you have your bandsaw delivered safely to your shop, you can begin the uncrating process. You can use a hammer with a pry bar or even a reciprocating saw to remove the crate from the saw. Cut the plastic off the machine and remove it. Inside the plastic you will find a black plastic tool kit. The tool kit includes a push stick, allen wrenches, open end wrenches, a factory manual and 4 leveling bolts. *See Figure 3, Tool Kit* . Use the appropriate metric wrench in your tool kit to remove the two lag bolts that secured your saw to the frame. Once you have removed the bolts slide the bandsaw off the pallet. or lift the saw, with the two hoist holes on the top of the saw.Please be careful and observe all normal precautions and safety procedures while working on, moving, and operating this machine.

MOBILITY KIT

If you purchased the mobility kit you will only use two of the leveling bolts found in the toolkit. Mount the wheels to the left side of the base of the saw using the two bolts supplied. See *Figure 4 Below, Mobility Wheels Mounted*. An easy way to do this is tilt the saw up and slide a piece of wood under the frame. This will give you the clearance you will need to mount the wheel bracket. The Johnson bar then gets placed

Fig 3 Tool Kit

under the footbrake and you are ready to roll the machine around. *See Figure 5 Below, Johnson Bar Placement*. Note: Always be careful where you place your Johnson. The bar can be easily and handily stored by placing the hook in one of the empty lift holes at the top of the saw.

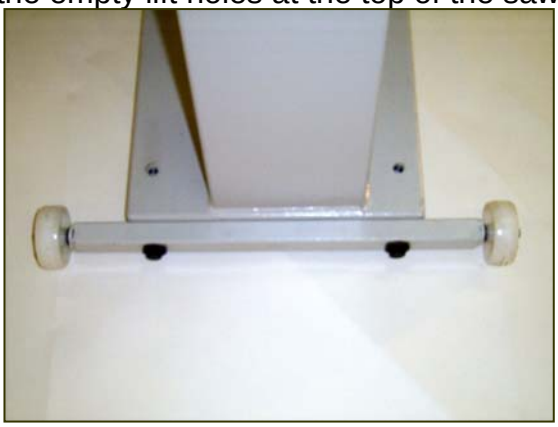

Fig 4 , Mobility Wheels Mounted.

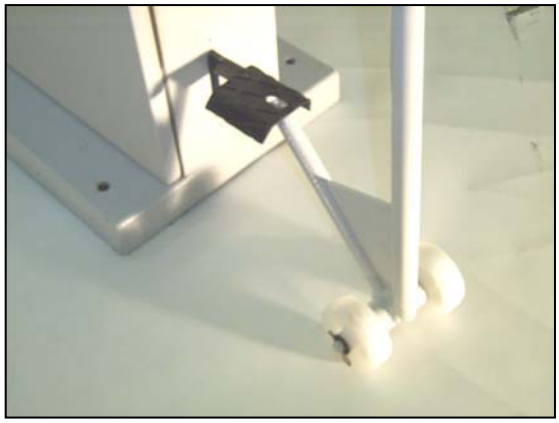

Fig 5 Johnson Bar Placement

If you will not use the Mobility system, Insert the leveling bolts into the threaded holes as shown below. *See Figure 6, Leveling bolts, Below.* Turn the bolts "in" to raise that end of the machine. Most users have found that the machine is stable without being bolted to the floor. Although the regular manual suggests this, you may use your own judgement. Obviously if you use the mobility system, it will not be bolted down. Another option is to use wooden wedges. If the machine is moved even a few inches, the floor could change the level.. With a wooden wedge the short leg can be found and the wedge pushed under a little further to reestablish the level. If the machine is going to stay put, it is helpful to put rubber pads under the bearing legs. Glue a piece of wood to the pads as needed for level operation. This is better than having the machine resting only on leveling bolts

Fig 6 Leveling Bolts

CLEANING AND ELECTRICAL NEEDS

Cleaning

You are now ready to start the cleaning process. Be sure to clean all the cosmoline grease off the machine. You can use WD40, Kerosene or one of the citrus based solvents. One important side note is to remove the clear plastic blade guard and clean that only with soap and water. Oil based solvents like

WD40 or mineral spirits will cause the guard to fog permanently. Pay special attention to cleaning the 3 micro switches on the saw*),* one connected to the foot pedal (behind lower wheel), one each behind upper and lower doors
Take your time when cleaning the machine. This will give you the opportunity to to familiarize yourself with this new addition to the shop.

Wiring

Now that you have spent the last 60-90 minutes cleaning the machine you are ready to get the machine set up electrically

NOTE: DISCONNECT ALL POWER BEFORE ATTEMPTING FOLLOWING PROCEDURE!!!!! MINIMAX STRONGLY SUGGESTS THAT YOUR WIRING AND CIRCUIT INSTALLATION BE DONE BY A LICENSED ELECTRICIAN ACCORDING TO YOUR LOCAL CODE!

You will need to wire your saw to a 220/240V outlet. Depending on the saw you purchased you will need a 20 amp or 30 amp breaker separate circuit. Many MM16's run very nicely with a 20 Amp circuit and #10 or 12 wire. Similarly many use a 30 amp circuit with #10 wire for the MM20. If there is any question in your mind, contact an electrician! (See Figure 7 Electrical Nameplate)

If you purchased a single phase machine (all MM16's and single phase MM20's) the machine will have 3 wires. The yellow/green wire is the ground and the other two are your hot wires. It does not have or use a neutral wire.

Fig 7 Electrical Nameplate

If your machine is 3 phase and the machine is running backwards, disconnect the power and switch two of the hot legs.
The MM16 has a short cord on the machine.
You can:

- connect a twist lock plug to it and then run an extension cord to it,
- wire the existing cord to a junction box that you add
- ,or, you can replace the existing cord and hard wire the machine.

Fig 8 MM20 Box

The MM20 has a small junction box already on the machine. (See Figure 8, MM20 Box)

ONCE AGAIN: Make sure the machine is disconnected from the power source when wiring the machine or the circuit breaker is turned off(put a piece of tape on the breaker switch to prevent accidentally turning the electricity on) if you are hard wiring the machine !!!!!

Fig 9 On Off Switch

To turn the machine on, First make sure both upper and lower doors are closed. Micro switches control the upper and lower doors and the foot brake. The Band Saw has a larger red off button and black on button. (See Figure 9 On Off Switch) The off button

needs to be reset to restart the saw. The Off button may need to be pulled out or twisted **GENTLY** to reset it, depending on the type of switch on your machine. It is perfectly allright to test start the machine without a blade. If it does not start, make sure the doors are closed and also be sure that there is no Cosmoline gumming the safety microswitches.

DUST COLLECTION PORT SIZE AND AIR REQUIREMENTS

Dust Collection

Both the MM16 and MM20 have a 100mm(very close to 4”) extraction port located on the mid right side of the saw See Figure 10 Dust Outlet. You may connect a 4" flex hose directly or use a quick disconnect adaptor flange - 4" flex hose to 100mm (available from Onieda Air Systems, see sources). Depending on the particular hose or parts you get, it may be necessary to use a rubber plumbing connector (4”) with two hose clamps to adapt your hose or the quick disconnect to the outlet.

A replaceable plywood deflector below the lower guides helps direct the dust to the port.See Figure 11 Dust Deflector..

Figure 10 Dust Outlet

Fig 11 Dust Deflector

CFM Requirements)

For a 4” Flex tube, a conservative estimate is about 800 cfm on your collection system to capture dust effectively. The actual figure can be estimated by a Cyclone or dust collection supplier such as Oneida Air(See resources).It of course depends on the distance from the collector and the pipe sizes and geometry.

BLADE SELECTION/GUIDE ADJUSTMENT/MOUNTING BLADES

Blade Selection (BE CAREFUL, BLADES ARE SHARP!)

WIDTHS: Common blade widths are 1 1/4", 1", 3/4", 1/2", 3/8" ,1/4" , 1/8", 1/16" You will find that 1", 1/2", 1/4" blades cover a wide range of woodworking tasks.
TEETH: The number of teeth per inch of blade (TPI) will range from 3 TPI to as high as 14 TPI. Rough work and very thick wood uses fewer TPI while narrower widths and fine work use higher TPI.
TOOTH TYPE: Hook/Skip type are good for re-sawing, ripping or joinery
BLADE TYPES:Blades can be had in carbon steel, Bi-metal or carbide tipped blades. General woodworking needs can be met with a variety of types. Both Carbon steel and Bimetal can be very effective. Carbide blades are a powerful addition to resaw capability but must be suited to the saw.For example, the 1" wide carbide blade offered by Mini Max is not recommended for the MM16 because the smaller wheel radius flexes and work hardens the blade leading to premature breakage before dulling. A 1" Carbide is however very well suited and effective on the MM20 and larger saws.
Note: Mini Max sells the Olson line of bandsaw blades. other options are offered in our sources section.

GUIDE INSPECTION AND ADJUSTMENT

The guides are European ball-bearing type For very narrow width blades, MiniMax is developing a "cool block" guide system for using 1/8" and smaller blades

LOWER GUIDES

On the MM16 or MM20, remove the lower guides. (See Figure12 Lower Guides)
This is a good chance to check to see if the guides are cleaned of the Cosmoline!
Loosen the allen screws (in the back) that hold the guides to the aluminum bracket. Align the guides and tighten the allen screws. Back the guides off and then move them back together to double check the adjustment before re-installing the guides. While the guides are out, sight them from the top to make sure the two guides are toed in slightly towards the front. (this is what makes them spin and captures the blade just behind the gullets) If they are not,or the guide wheels spin in opposite directions when the saw is run with a blade installed, call the Austin Office to report it and get instructions for a fix.

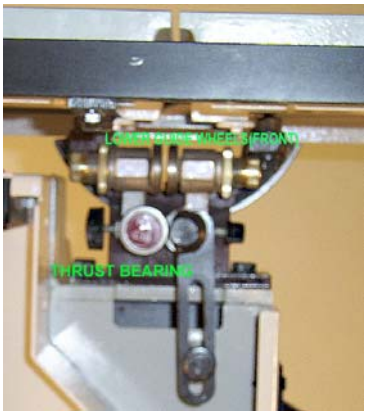

Fig 12 Lower Guides

Fig 13 Upper Guides Front

UPPER GUIDES

starting with the top guides (See Figure 13 Upper Guides)

1).Screw the two side guides in and make sure they are meeting up with each other like stacking coins. If they do not match up, loosen the two allen screws from the back and then adjust (twist) the guides so

that they meet each other perfectly.
2) Tighten the allen screws.
3) Open the guides up a little and then bring them back together to make sure that they meet up correctly. This is to make sure that the bit of play in the guides does not give a false indication as to how they meet.
4) Next, screw the guides together with the adjuster knob so that they just barely touch. Sight them from the top and see that they are toed or angled forward just a little and that the inner and outer look the same. If they are close, all is ready for installation of the blade

MOUNTING BLADES

NOTE:BE SURE POWER IS DISCONNECTED FROM SAW

Back the guides off (open them) and install the blade as follows:
1- Remove clear plastic guard
2- Open cabinet doors
3- Raise telescoping blade guard (See Figure 14 Guard Assembly

Fig 14 Guard Assembly

4- Adjust upper & lower guide assemblies out of the way of the insertion of blade
5- Insert blade on tires, adjust so teeth are just barely protruding beyond outside edge of tires (teeth should point downward toward table, if not turn blade inside out)
6- Adjust tension
7- Adjust tracking by spinning wheel manually to check tracking and blade location
8- Check that the plane of the top and bottom wheels are in the same plane(Coplanar, see Coplanar section) Note that many experts insist that this is not an issue with flat tires such as those on the MiniMax bandsaws.
9- Adjust upper and lower thrust bearing 1/64 (.016) inch gap behind blade. Check to see if the back of the blade lines up with the thrust bearing in the correct place. The back of the blade should make contact close to the center of the outer machined area of the trust bearing. If the blade is too far out on the edge, the blade will tend to slide off the edge. If the blade is too far towards the center, the thrust bearing may not spin correctly and may be damaged. A one time adjustment for positioning the thrust bearing may be made on the top guides by loosening the bracket holding the entire guide assembly to the bottom of the guide post. It slides the guide diagonally to move the bearing side to side.(See

Fig 15 Horizontal Adjustment

Figure 15 Horizontal Adjustment) ***The blade should never hit the thrust bearing until the wood pushes the blade back during cutting.***
10) On the lower guides, you need to make a similar check of the alignment of the back of the blade to the thrust bearing as you raise or lower the guides in reference to the table. Note there are two pivot points on the lower guides to adjust them parallel with the blade.
At this point the top and bottom guides are set up and ready to be set for the particular blade.
11) Loosen the bolt that fastens thede the round rod forward. Slide the rod and guides forward, so that the front edge of the side guide is just behind the gullet. Look from the front to make sure the guides are parallel with the blade as the bolt is tightened.
12) Adjust upper and lower guide bearing leaving .004 inch gap between blade and bearing (Thickness of a dollar bill folded once) Adjust the side guides in while you are spinning them with a finger. When the guide can be felt just touching the blade, back it off a hair. Now tighten the lock. As the lock ring tightens, turn the guide adjustment with it to cinch it down securely. Now spin the guide. You should barely feel it touch the blade
11) Close doors and reinstall plastic blade guard
12) Rotate blade by hand to check tracking
13- Plug in saw, turn power on to check operation

ADJUSTMENTS (TENSIONING, BLADE TRACKING SQUARING BLADE TO TABLE)

ADJUSTMENTS

Tuning and tweaking a bandsaw is the key to accurate, precise and simple cutting. Your enjoyment will be in direct proportion to the energy you expend on fine adjustment and tune-up.
MiniMax bandsaws have “flat” tires versus “crowned” tires.The flat tire offers better support for the blade while cutting and increases accuracy.

TENSIONING A BANDSAW BLADE

The tension gauge supplied on the machine does not show true tension but rather serves as a point of reference. See Figure 16 Tension Gauge. It serves that reference function best after you establish the correct tension for each blade. See Figure 17 Tension Aduster
Correct really means the tension that works best for the particular blade in use.) Set tension by gently pushing blade sideways with finger. The blade should deflect approximately 3/8 inch sideways with the telescoping blade guard at full

Fig 16 Tension Gauge

height or about 1/4" deflection when distance between upper and lower guides is set at 6" or less. Because each person's

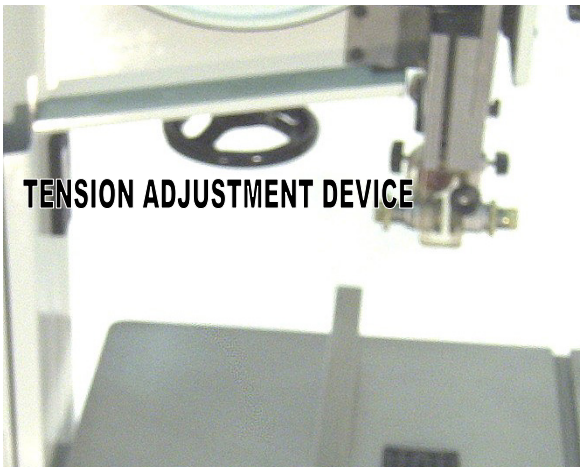

Figure 17 Tension Adjuster

definition of moderate pressure varies you may wish to borrow or purchase a tension indicator.

If using some of the so called "lower tension" blades, it is strongly suggested that the manufacturer's instructions be followed. A few suppliers are listed in the sources section.

Carbide, Bi Metal, Stellite and Carbon steel blades require different amounts of tension ranging from 15,000 to 30,000 psi.
Once you find the proper tension for the blade(s) you use you can create your own indicator marks lines for repeatability. A good recommendation is to use different colored markers and color code the different blade widths.

TRACKING

You can not track a blade until the proper tension has been set! Pay careful attention to the preceding section on proper tensioning of the blade. The width of the blade dictates where it should run on the tire.
A rule of thumb suggests that anything over a ½" blade should have the teeth slightly over hang the tire. This is to prevent premature wearing of the tires. Smaller bl run as close to the center of the wheel as possible. This is to

Fig 18 Tilt Adjuster

Fig 19 LOWER WHEEL TILT

prevent the blade from “walking” off the wheel.

The knob on the back of the upper cabinet is the tilt adjustment on the upper wheel. See Figure 18 Tilt Adjuster. This knob allows you to change the position of the blade on the tire. Loosen the locking gib and then rotate the knob. Always rotate the wheels backwards when adjusting the saw. This will decrease the possibility of you catching a tooth on something if the blade was too far forward. Once you set the blade for the upper wheel lock the gib handle back in place.

The lower wheel can be adjusted at the rear of lower cabinet. There are four bolts. **DO NOT TOUCH THE BOLTS AT 3 & 9 O’CLOCK!!! (Right and Left)**

See Figure 19 Lower Wheel Adjustment. To tilt the wheel Back (Top further from the door), loosen the center hub bolt, loosen the lower bolt and tighten the upper bolt. To tilt the wheel Forward(Top closer to the door), loosen the top and tighten the bottom. Again rotate the wheels in reverse to check where the blade end up. Once the lower blade is tracking to your satisfaction, lock the hub bolt again.

SQUARING BLADE TO TABLE

SIDE TO SIDE SQUARENESS

After all tracking and tensioning of the blade is accomplished, check the blade for

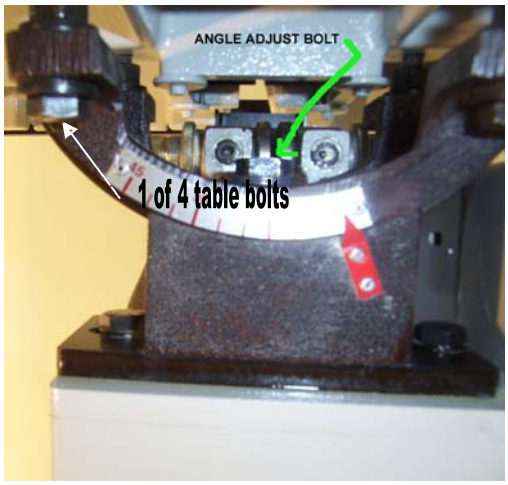

Fig 20 Table Adjustment

Fig 21 Positive Stop

table squareness. Use a simple machinists square. If the table is grossly out of square with the blade, check to see if the table tilt mechanism has been moved. If so, loosen the trunnion clamp bolt and square the table. To square the table to the side of the blade, first loosen the large single bolt (within the table tilt scale) which secures the table to the frame. (See Figure 20 TABLE ADJUSMENT). Then adjust the angle by turning the positive stop bolt (small bolt and nut on underside of table (See Figure 21 POSITIVE STOP) in either direction then pushing the table up or down, until the table is square with the blade.And the table is against the positive stop. Tighten large trunnion bolt.

FRONT TO BACK SQUARENESS OF TABLE TO BLADE

Use the four adjusting bolts in the trunnion on the under side of the table for adjusting the back of the blade to the table (See Figure 20 TABLE ADJUSTMENT again) . These are bolts with lock nuts and they can push or pull on the table. Experiment with loosening and tightening these adjusters till the table is square to the back of the blade.

VERTICAL GUIDE POST ADJUSTMENTS

Adjustment of the vertical guide post requires that the lock knob on the side of the saw be loosened,and the adjusting knob turned to raise or lower the guide assembly..(See Figure 22 GUIDE POST ADJUSTMENT). When re-positioning the height of the upper guide assembly to be close to the height of the material to

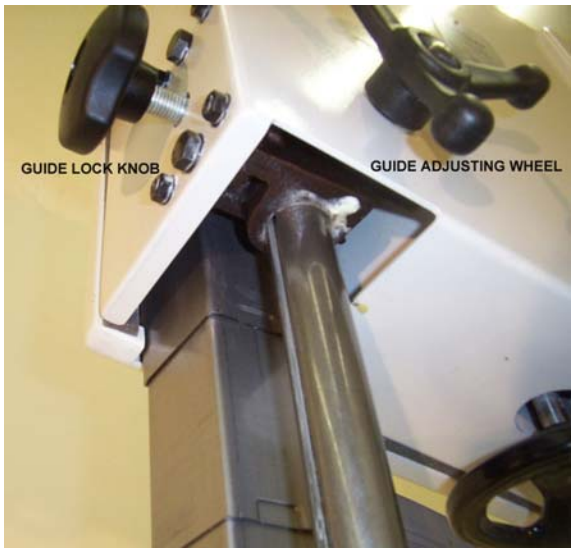

Fig 22 Guide Post Adjustment

Fig 23 Upper Guide Post Alignment

be cut, the guide bearing adjustments made earlier should stay in position and in-line with the blade. If not, loosen the two center bolts See Figure 23 UPPER GUIDE POST ALIGNMENT*)* behind the locking knob and move <u>lightly</u> by hand until the bearings remain in line even with vertical movement of the guide post. The lower guide assembly can also be adjusted vertically to give firmer support to the blade while cutting. In other words moved closer to the underside of the table. Adjust by loosening the 17mm bolt (See Figure 24 Lower Guide Adjust Bolt*)* that clamps the lower assembly and slide the assembly up or downup or down. Tighten the securing bolt.

Fig 24 Lower Guide Adjust Bolt

ADJUSTMENTS TO THE PLANE OF THE WHEELS

Coplanar in Bandsaw terms means that the upper and lower wheel faces are in exactly the same plane . This state keeps the blade well supported for accurate sawing and blade tracking. There are differences of opinion as to whether a flat wheeled saw such as the MiniMax MM16 and MM20 really needs to be coplanar. Nevertheless, the following routine will indicate whether your wheels are in the same plane and will present instructions for achieving this advanced state.

Wheels are adjusted to the same plane at the factory using the appropriate settings for a 1 ¼" blade. This may not necessarily mean that the wheels will be coplanar for smaller width blades. The reality is that when smaller blades (ie 1/2") are used, the blade may not track exactly the same on both the upper and lower wheels. This is normal and perfectly okay as long as the back of the blade remains square to the table. If it is not square to the table, the following adjustments will help whether you are aiming for a coplanar condition or not.

STEPS TO ADJUST THE PLANES OF THE WHEEL (COPLANAR)

1) Prepare a 3/4" plywood template approximately 10" wide, by 67" long with one edge perfectly straight
2) Cut an arc out of the template to bypass table, (or remove table). Cut notches as needed to bypass the wheel hubs and the saw frame.
3) With your widest blade on and fully tensioned hold the template against the face of the upper and lower wheels. If the wheels are coplanar, the straight edge of the plywood template will be in contact with the top and bottom of each wheel.
4) If there is a gap on either the top or bottom on the lower wheel, then the plane of the wheel needs adjustment.
5) On lower wheel hub on outside of frame, loosen center bolt, loosen lock nuts on the appropriate bolts to adjust (usually top and bottom at "6 and 12 o'clock) (See Section on wheel adjustment above and See Figure25 Lower Wheel Adjustment), adjust wheel into coplanar by
loosening one and tightening the other in order to tilt the wheel in the desired direction.
6) Reheck with template; tighten locknuts and center hub bolt;
7) Stabilize blade by spinning the wheels by hand. This will indicate how the blade will track and thus position the blade to check for not only the same planes for both wheels but the squareness of the blade back to the table.

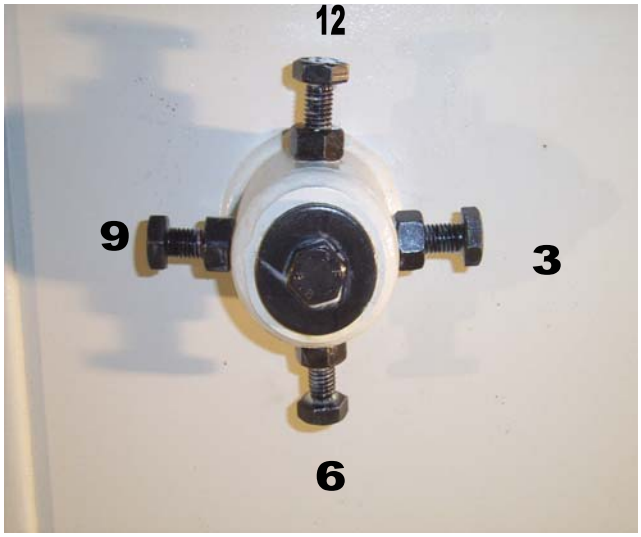

Fig 25 LOWER WHEEL ADJUSTMENT

TILTING THE TABLE, ADJUSTING THE MITER GAUGE, FENCE, AND THROAT PLATE

TABLE TILTING

The bandsaw table will tilt up to 45 degrees. To tilt the table loosen the large bolt enough for the table to slide in both trunions in the table tilt scale and adjust tilt by hand (SEE FIGURE 26 TRUNNION BOLT). Tighten the bolt. Note that if the lower guide assembly has been positioned close to the bottom of the table it will be necessary to move this guide assembly down in order to tilt the table more than 10 degrees. On some machines, if the bolt is only partially loosened, the

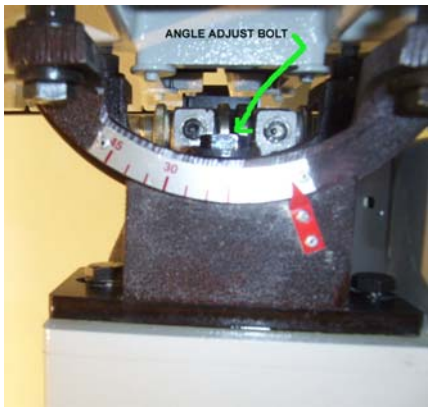

Fig 26 TRUNNION BOLT

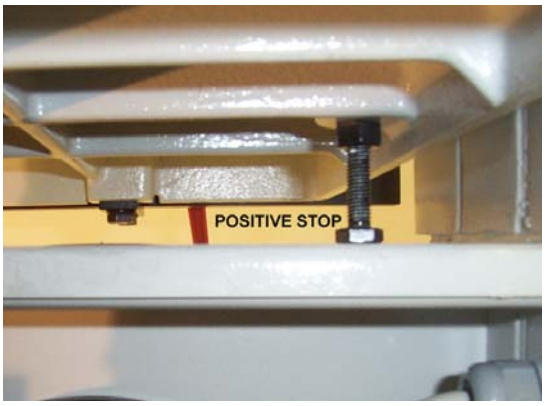

Fig 27 POSITIVE STOP BOLT

left trunnion tends to bind a bit. You can tilt about 8-10 degrees in the opposite direction by removing the zero degree positive stop at the rear underside of the table.(SEE FIGURE 27, POSITIVE STOP BOLT) . This may be desirable for such operations as cutting Bandsawn dovetails where the ability to tilt in both directions is useful.

On some saws, the tilt mechanism trunnions are very tight. This can be eased by removing the table and using some very fine valve grinding(abrasive) compound to loosen the sliding action of the trunnion. Valve grinding compound

looks like a gray sharpening stone that was turned into paste. It can be found at an auto parts store where both coarse and fine is available. Both grits are useful to polish trunnions, miter slots, and the kinds of roughness or binding often found on machine tools.

MITER GAUGE AND SLOT

If the miter gauge binds in the slot, slide it along the slot to find out where it binds. Use a fine file dragged along the edge of the slot. Then polish the slot and the miter gauge bar with some fine emery cloth. A piece of oak to back up the emery cloth will keep the repair flat and square. Frankly, a miter gauge is of very little use on a bandsaw so don't waste too much time adjusting it.

ADJUSTING THE FENCE

Fence and Blade drift

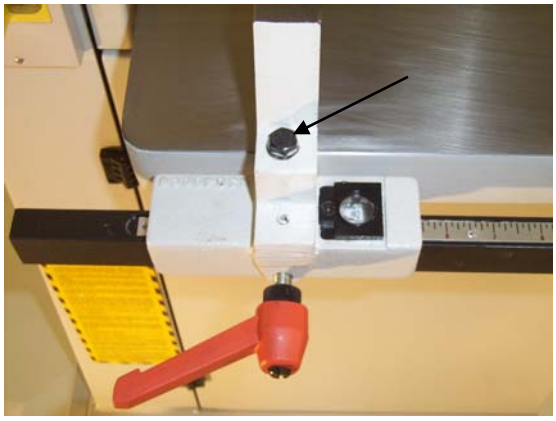

Fig 28 Fence Adjustment Bolt

Blade drift means the blade isn't cutting parallel to the fence. Every blade will cut in a slightly different manner and you may have to adjust the fence angle to compensate for this drift. To check blade drift, mark a straight line on a board 24" long, rip the board freehand while carefully following the line About halfway, through the cut, stop the saw and leave the board in place. Mark the side of the board on the saw table with a soft pencil. This line indicates the appropriate angle for the fence. Move and adjust the fence parallel to this line (and therefore parallel to the direction that the particular blade wants to cut).The fence angle may be adjusted by loosening the top bolt in the fence assembly. Pivot the fence about the roll pin and tighten the bolt. (SEE FIGURE 28 FENCE ADJUSTMENT BOLT).

THROAT PLATE ADJUSTMENT

The height of the throat plate is adjusted by 4 screws. A fine screwdriver may be used to adjust the plate absolutely flush to the table.(SEE FIGURE 29 THROAT PLATE ADJUSTMENT

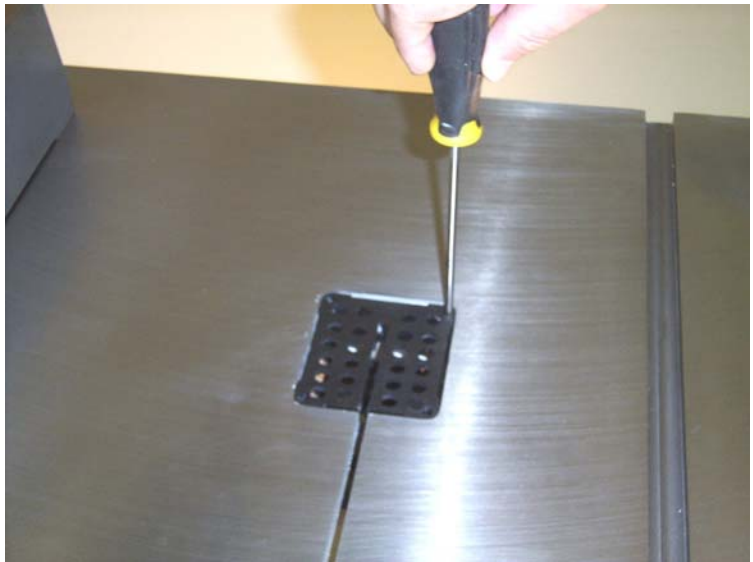

Fig 29 Throat Plate Adjustment

HELPFUL HINTS

BLADE SELECTION: What blade for what purpose ?
RE-SAWING/RIPPING: 1" Blade with 3/4 pitch (tpi) hook/skip tooth blade
LIGHT RE-SAWING/RIPPING: ½"Blade with 3/4 pitch hook/skip tooth blade
CURVES AND JOINERY: ½" Blade with 8/10 pitch(tpi) for joinery cuts and curves larger than 2 -1/4"radius
TIGHTER CURVES: 1/4" Blade with 8/10 pitch for joinery and curves larger than 3/8" radius

GENERAL SMART THINGS TO DO

- Clean table and fence frequently and wax with paste wax to eliminate friction.
- Round back of blade with file or honing stone to eliminate scouring of thrust bearing and help prevent binding while cutting curves.
- Coat the blade with paraffin/blade lube to ease cutting and reduce pitch build-up. (Spray "PAM" works well.)
- Check bearings for sawdust buildup to prevent damage to bearings.
- Keep holes in "table insert" clear for effective dust collection.
- Always remove tension from blade at the end of day (establish a "signal" such as a ribbon to hang from the door as a reminder to retension before starting the saw!)

TROUBLE SHOOTING CHART

THE PROBLEM	PROBABLE CAUSE?	ACTION
Motor won't start	No current in circuit	1. Plug saw in 2. Check circuit breaker in the dedicated circuit. 3. Check if stop button is released. Clean cosmoline from micro-switches on doors and brake(stuck open?) 4. Adjust door switches by loosening switch holder nuts and move switch towards door. Listen for the click when switch is in
Motor overheats	Wrong voltage	1. Check circuit voltage 2. Check wiring diagram be sure it is

		followed in hookup.to voltage on nameplate
Blade doesn't cut straight	Dull or badly sharpened or set blade	1. Change blade 2. Sharpen and set if you are an expert
Blade wobbles	Wheels not coplanar, Low blade tensioning, Guides or bearings not adjusted properly	1. Adjust as in section "ADJUSTMENTS TO THE PLANE OF THE WHEELS". 2. Increase blade tension as in "BLADE MOUNTING/TENSIONING" Section. 3. Adjust guide settings as in "GUIDE ADJUSTMENT SECTION". 4. Check for bad weld on blade.
Blade "Ticking"	Crooked weld on blade	1. Smooth weld with file 2. carefully hone with stone while blade is running

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THE SIX RULES OF SAWING

FOR TURN SCREW AND SPRING TENSIONING MACHINES

Remove guides--you CANNOT run this test if the band saw blade is restricted in any lateral movement.

Make sure tire surfaces are in good condition--they cannot be hard, flattened out, cracked or brittle. On mills with loose fitting V-belts, replace them with the next size down so they are tight fitting. This will eliminate over 80% of the vibration in your mill and the blade.

Mount the blade on the machine and apply the tension to the band that the manufacturer recommends for other steels.

Close all covers for **safety** purposes.

Start the machine, engage the clutch into the high speed cutting mode. **NOTE:** You will not be cutting any wood.

Stand at the head of the machine, with your hand on the turn screw tensioner and your eyes on the band saw blade. **Very slowly** start detensioning by half turns at a time, keeping your eyes on the band saw blade. The object is to bring the tension of the blade down to a point that the blade starts to flutter. TAKE YOUR TIME.

When you see the band start to flutter, you have hit ground "ZERO". Now start ADDING quarter turns of tension, SLOWLY, until the band stops fluttering and is running

stable again. At this point ADD one-eight to one-quarter turn of tension.

You have now tensioned our blade correctly. Shut off the machine and put your guides back in place. You are now ready to start sawing.

ALWAYS DETENSION YOUR BAND SAW BLADES. Since you do not know exactly where the proper tension is, it will be easier to remember if you take off 8, 9, or 10 full turns of tension until the band is completely relaxed. The next time you use our bands, add the same amount of turns of tension that were taken off. At this point, you will only have to run the flutter test one time.

WARNING: **IF YOU DO NOT RUN THE FLUTTER TEST ON OUR SPECIAL SILICON STEEL BLADES, YOU WILL NOT ACHIEVE THE ENDURANCE AND LONGEVITY THAT OUR HIGH DUCTILE BANDS ARE CAPABLE OF.**

CHOOSING THE PROPER BAND SAW BLADE LUBRICATION

NEVER USE WATER as a lubricant on band saw blades. Water is NOT a lubricant and is the WRONG thing to use for many reasons.

For the woodworker using 1" and 1 1/4" bands, not only is water unacceptable as a lubricant, but it also rusts the bands causing deep pitting, and inappropriate chip swelling. This prematurely destroys the body of the band and its gullets. It also dry rots your tires or V-belts.

For proper lubrication mix HIGH ADHESION CHAIN SAW BAR OIL, with 50% kerosene or diesel fuel. Apply the solution with a spray bottle to BOTH sides of the band about once every four minutes, while the machine is running. When this lubrication is applied, the sound of cutting decreases over 50%. DO NOT APPLY AGAIN until the sound of cutting starts increasing. I guarantee you will be amazed! Longer life; No pitch buildup; No rusted or pitted bands! A great delivery system is the 12 volt windshield washer assembly out of an old car!

"Pam" spray-on vegetable shortening is a great lubrication for 3/4" WIDTH AND UNDER band saw blades on vertical saws. (EXAMPLE: Delta, Grizzly, Jet, etc.) Unplug the machine. Spray Pam vegetable shortening on a rag and wipe on both sides of the blade while turning the upper wheel by hand. You will hear a 50% sound reduction when cutting.

A band saw blade is a tool. You must lubricate both sides!

In both cases, we know for a fact that lubrication of the body of the band increases band life by over 30%. **Applied sparingly**, you can cut grade lumber with NO staining to your product.

ALWAYS DETENSION YOUR BANDS

When you are done cutting for the day, take the tension off your blade. Band saw blades, when warmed up from cutting, always stretch; and upon cooling shrink by tens of thousandths of an inch each cooling period. Therefore, blades, when left on the saw over tension themselves and leave the memory of the two wheels in the steel of the band, which will cause cracking in the gullet. When you leave the band on your saw under tension, not only do you distort the crown and flatten out the tires (which makes them very hard), but you also place undue stress on your bearings and shafts. Believe it or not; you can, and will damage your wheel geometry sooner or later and considerably shorten bearing life. You are also crushing your tires or V-belts.

WHAT IS APPROPRIATE SET?

Appropriate set is when you have a mixture of 65%-70% saw dust and 30%-35% air in the space between the body of the band and the wood you are cutting. The SIGN you are looking for, when you are running appropriate set, IS A GOOD 80%-85% SAW DUST EJECTION FROM THE CUT! If you are running too much set for the mass or thickness of the wood, you have too much air and not enough saw dust. You will leave **EXCESSIVE** loose saw dust and most likely it will be accompanied by tooth marks. If you are running under set, you will have no air flow pulling the saw dust out...The SIGN for this is excessive HOT **packed** down saw dust. This is the most damaging thing you can do to a band. You will have short cutting times and premature band breakage. The saw dust should be warm to the touch, not hot or cold. One last thing, a band that is excessively under set will cut in a wavy motion, and a band that has an improper HOOK ANGLE and is UNDER SET will cut a bow across the board every time!

WHAT IS HOOK ARTICULATION?

Because of our deep gullets, we are able to use lower hook angles which generate less heat on the tip of the tooth. The Timber Wolf® series of bands uses a 10 degree rake or hook angle which is capable of penetrating most surfaces from

medium-hard to medium-soft woods.

If you are cutting very hard wood like white oak, walnut, ash or anything frozen throughout, the blade will probably rise in the cut. This is called push-off. The hook angle must be brought back to 8 degrees. You will notice as the angle goes from 10 degrees to 8 degrees, the tooth becomes more perpendicular, thus INCREASING its penetration factor.

As the tip of the tooth goes from 10 degrees to 12 degrees the tip of the tooth starts pointing forward DECREASING penetration in hardwood. If you use 8 degrees on soft wood the blade may chatter because it's over feeding itself, unless it's very knotty. You need to use an 8 degree hook angle for hard knots. On the other hand, if you use a 12 degree hook angle on very hard wood, the tooth skips over the hard surface because the tip of the tooth is pointing too far forward.

Having a 12 degree hook angle in hardwood cutting causes push-off making the band ride up. The band locks itself in place, cuts straight across, and drops down at the end of the cut. This also burns up the band and over tensions it.

By articulating the proper hook angle, and having your gullet mathematically correct for the pitch, you will achieve straight grade cuts every time. YOU MUST UNDERSTAND APPROPRIATE SET AND HOOK ARTICULATION, THEY WORK TOGETHER. We manufacture for North America 5 appropriate sets with a 10 degree hook angle. 70% of the time this hook angle will be perfect for whatever you are cutting.

WARNING: Again just as I have brought to your attention the short life of a dial indicator, you are also trusting the templates and gauges on your band saw blade sharpeners. They are hardly set at the exact angle that you think they are. The machines themselves wear out. The pins and the guides in the sharpener that the back of the band rides on, wear out. If a band starts riding on an angle a few degrees and you are unable to see it, you will know there's something wrong after running that resharpened band. To give you an idea of the amount of wear your sharpener will receive, think of this. Your band, if 14 ft. long, will travel around your sharpener a minimum of twice during each sharpening. You have sharpened 50 bands. 50 x 14 ft. twice or 28 ft. = 1,400 ft. or over a 1/4 of a mile with the back of the bands rubbing on the alignment pins and wearing them out. How do you determine if your hook angle is right, and see it. Simple: THERE IS A TOOL FEW OF YOU HAVE. There is a specific tool made especially to measure your hook angle and that's a PROTRACTOR. You must have a specific TYPE OF

PROTRACTOR. Without it, you are blind and will never be able to articulate a band saw blade. Without a protractor, you are assuming the hook angles are right. I have analyzed over 4,000 band saw blades since 1992. Over half of the problems, were due to assuming the hook angle was right on. We have in stock precision **Starrett® band saw blade protractors,** at our cost. You must have one. **It's mandatory!**

GULLET PROCEDURE SHARPENING

THERE IS ONLY ONE WAY TO SHARPEN A BAND SAW BLADE. A stone must come down the face of the tooth, around the bottom of the gullet and up the back side of the tooth in ONE SWEEPING ACTION. You **MUST** maintain gullet integrity.

The gullet is NOT a trash can or dumpster for the saw dust. In fact, it is the second hardest working part of the band. A well defined gullet is like the inverted wing of an aircraft. It is responsible for the forced air flow, cooling the steel and removal of the saw dust.

If you are running appropriate set, the air is driven through the log by the gullet at the speed of the band. This causes the saw dust to be sucked out of the cut. The saw dust effectively cools the gullet by spinning around the inside and spilling over the back side of the next tooth. You **MUST** maintain a 40% gullet fill for proper cooling and extended cutting time.

If you sharpen just the face and the back side of the tooth, you ruin the gullet integrity and destroy the performance of the band.

THERE ARE 4 PARTS TO A BAND SAW BLADE AND THE IMPORTANCE OF EACH PART IS:

THE STEEL--The steel is the hardest working part. Less expensive brittle steel not only welds harder but must be highly tensioned, thus decreasing overall run time no matter what you do.

THE GULLET--The gullet is the second hardest working part of the band. It is the highway for proper air flow, causing the cooling of the band and chip removal.

THE TIP OF THE TOOTH--The tip of the tooth is the third most important, and we all know what that does. By the way, always keep a 10 degree hook angle. NO more, NO less for good general sawing. Very hard, frozen or knotty wood uses an 8 degree hook angle. These values bring the whole science of band saw blade physics and the ART of sawing together. On our videotape, there is a 40 minute segment dedicated on how to correctly sharpen a

bandsaw blade and also how to build, out of a 5" or 6" bench grinder, a manual gullet procedure sharpener. We include a schematic

When all is said and done, the band saw, in all its shapes and sizes, is a fundamental machine. But, as you have just read, there is a lot to know in becoming the master of your machine.

SPARE PARTS LISTS AND DRAWING

SPARE PARTS: In order to ensure prompt shipment of the necessary spare parts, it is absolutely essential to keep meticulously to the following procedures:

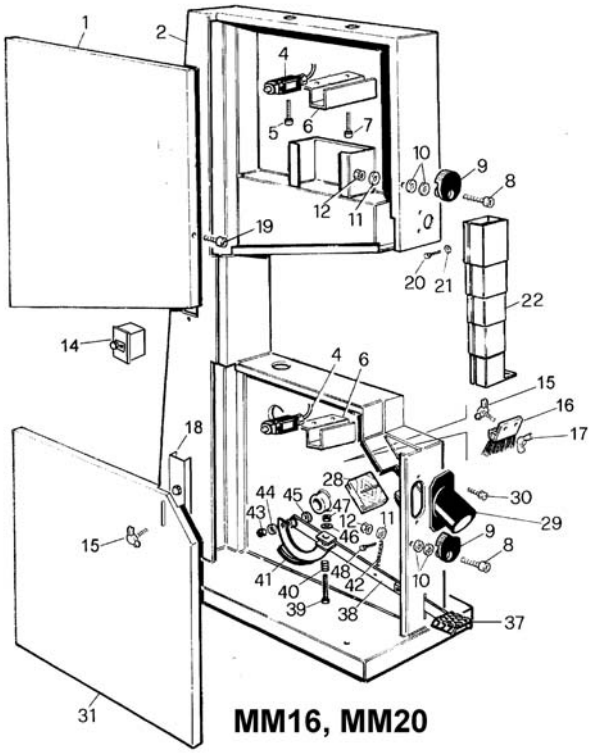
1) Indicate the model and part number of the machine.
2) Indicate the table, code and reference number of the parts required.
3) Indicate the quantity required.

Table. 1 MM 16-20 SEE ILLUSTRATION 1 FOLLOWING

Reference #.	MM 16 CODE	MM20 CODE
1	43040026	43050025
2	43040001	43050001
3	-	-
4	05061916	05061916
5	-	-
6	43040038	43040038
7	-	-
8	-	-
9	10140007	10140007
10	-	-
11	-	-
12	-	-
13	-	-
14	06452001	06452001
15	13101181	13101181
16	43070159	43070159
17	13710000	13710000
18	43040031	43040031
19	-	-
20	-	-
21	-	-
22	43040029	43050021
23	-	-
24	-	-
25	-	-
26	-	-
27	-	-
28	43040044	43040044
29	48097500	48097500
30	-	-
31	43040027	43050023

32	-	-
33	-	-
34	-	-
35	-	-
36	-	-
37	43070149	43070149
38	43040036	43052024
39	-	-
40	30101900	30101900

PARTS ILLUSTRATION FOR TABLE 1



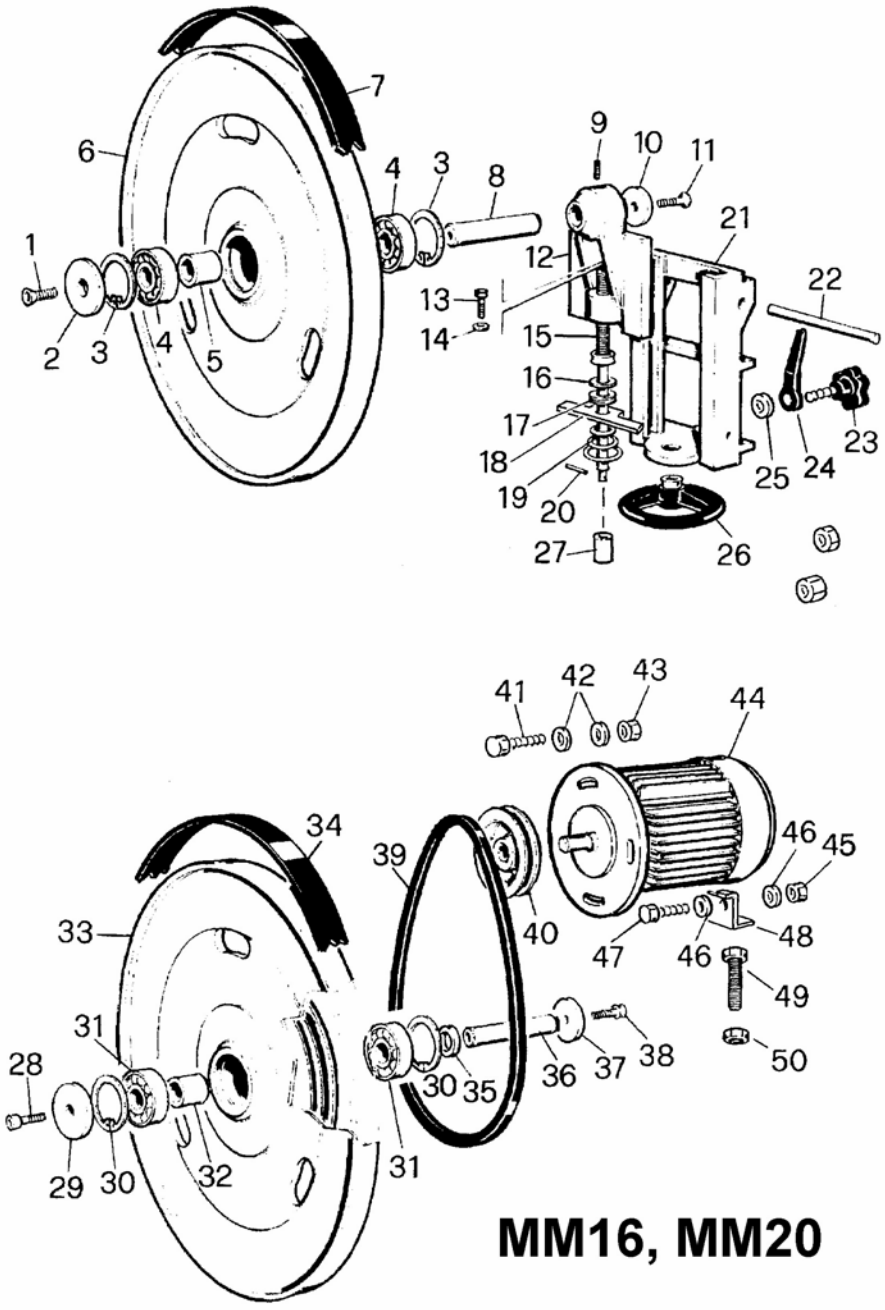
MM16, MM20

Table. 3 MM 16-20 SEE ILLUSTRATION 3 FOLLOWING

REFERENCE #	MM 16 CODE	MM 20 CODE
1	-	-
2	48132400	48022300

3	12010103	12010105
4	01080102	01020102
5	48132200	48011800
6	48138100	48149200
7	48132800	48012800
8	48130400	48095400
9	-	-
10	48132400	49011900
11	-	-
12	48130800	48021000
13	-	-
14	-	-
15	48130900	48021100
16	-	-
17	01210405	01210405
18	-	-
19	30020200	30030300
20	-	-
21	48130700	48020900
22	48131100	48140200
23	10011270	10140027
24	10160000	10160000
25	-	-
26	10044951	10044951
27	48097100	48097100
28	-	-
29	48132400	48022300
30	12010103	12010105
31	01080102	01020102
32	48132200	48011800
33	48138000	48149300
34	48132800	48012800
35	43040042	43060032
36	43040040	43060031
37	48132400	48022300
38	-	-
39	03190303	03190304
40	43040045	43040045
41	-	-
42	-	-
43	-	-
44	04114007	04115002/1 ph- 04132515/3ph
45	-	-
46	-	-
47	-	-
48	43040032	43040032
49	-	-
50	-	-
51	-	-

PARTS ILLUSTRATION FOR TABLE 3

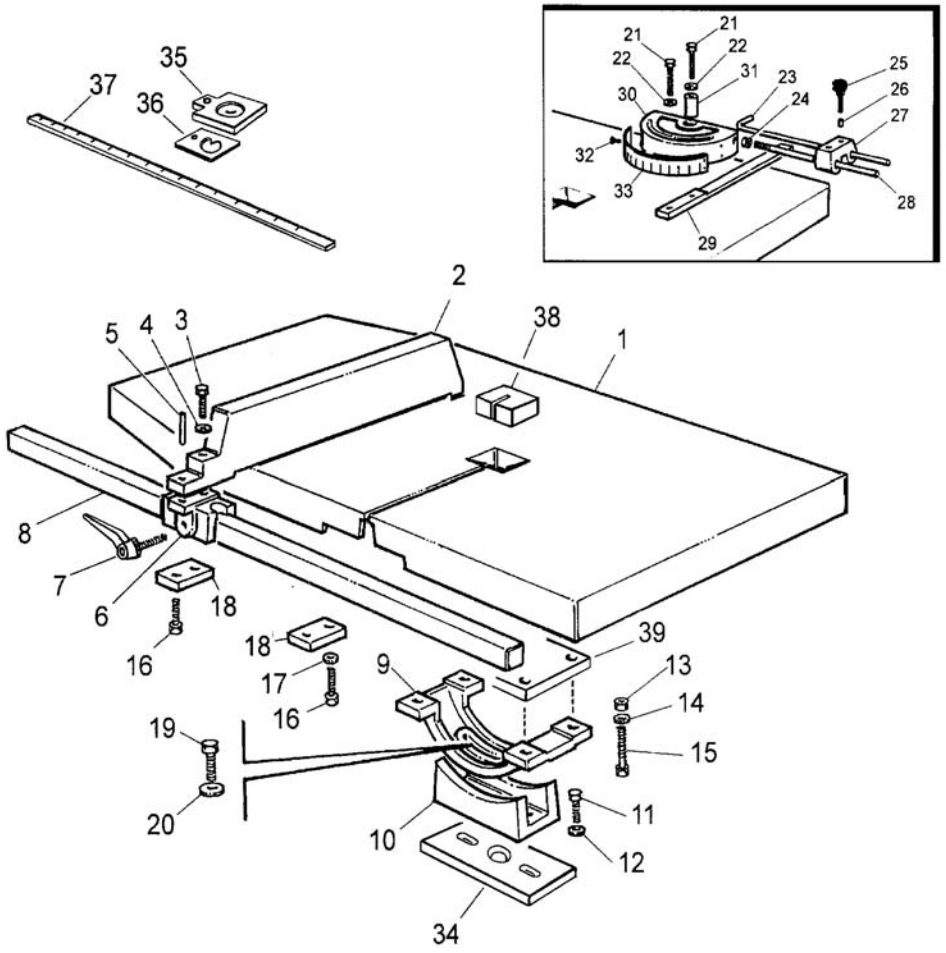


MM16, MM20

Table. 5 MM 16-20 SEE ILLUSTRATION 5 FOLLOWING

Ref. N r.	MM 16 CODE	MM 20 CODE
1	48130300	43052048
2	43040059	43040059
3	-	-
4	-	-
5	-	-
6	43040060	43040060
7	10066763	10066763
8	43040043	43050029
9	48132000	48132000
10	48132100	48132100
11	-	-
12	-	-
13	-	-
14	-	-
15	-	-
16	-	-
17	-	-
18	43040062	43040062
19	-	-
20	-	-
21	-	-
22	-	-
23	-	-
24	-	-
25	-	-
26	-	-
27	-	-
28	-	-
29	43040053	43040053
30	-	-
31	-	-
32	-	-
33	-	-
34	43040028	43040028
35	10230000	10230000
36	43040061	43040061
37	43040052	43050026
38	43040057	43070129
39	-	43050024
40	-	-
41	-	-
42	-	-
43	-	-

PARTS ILLUSTRATION FOR TABLE 5

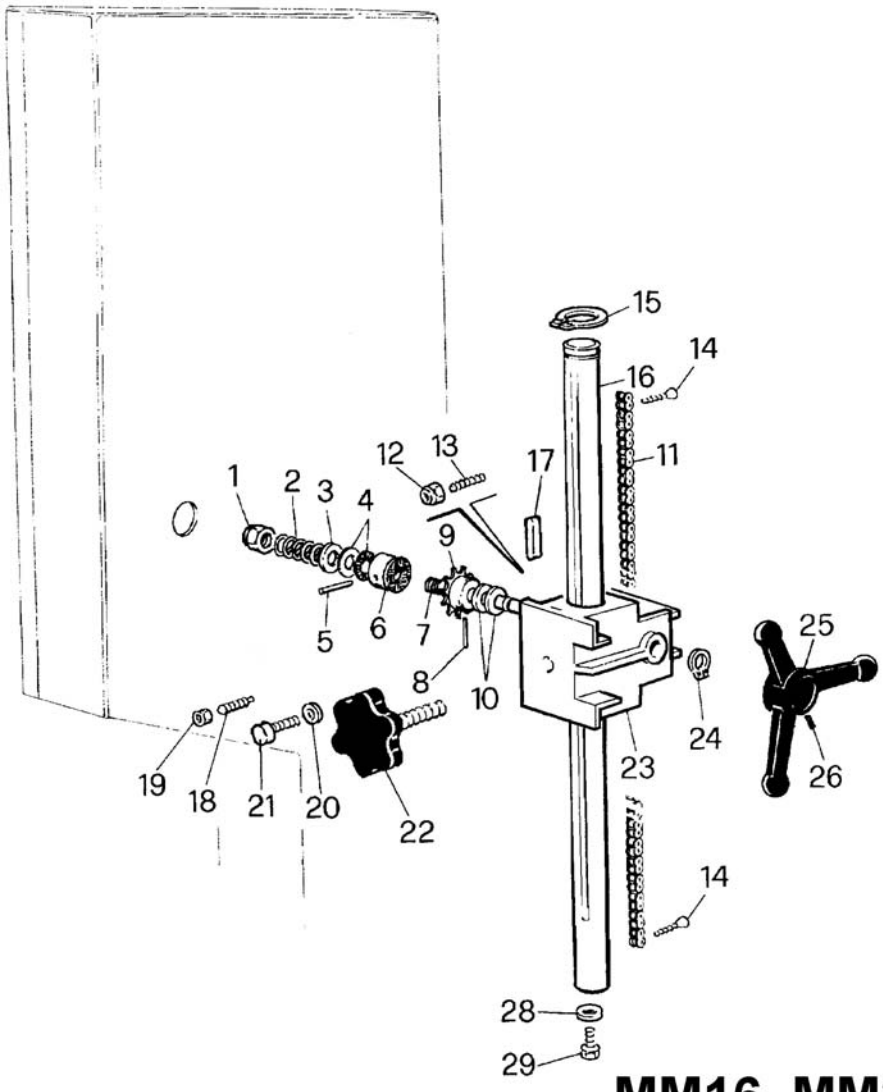


MM16, MM20

Table. 8 MM 16-20 SEE ILLUSTRATION 8 FOLLOWING

REFERENCE #	MM 16 CODE	MM20 CODE
1	13427171	13427171
2	30141000	30141000
3	48152401	48152400
4	01210405	01210405
5	-	-
6	48152400	48152400
7	43070132	43070132
8	-	-
9	48152200	48152200
10	-	-
11	43040030 K	43060027K
12	-	-
13	-	-
14	-	-
15	-	-
16	43040030	43060027
17	43070131	43070131
18	-	-
19	-	-
20	-	-
21	-	-
22	10140028	10140028
23	43060043	40070026
24	-	-
25	43070231	43070231
26		
27	-	-

PARTS ILLUSTRATION FOR TABLE 8

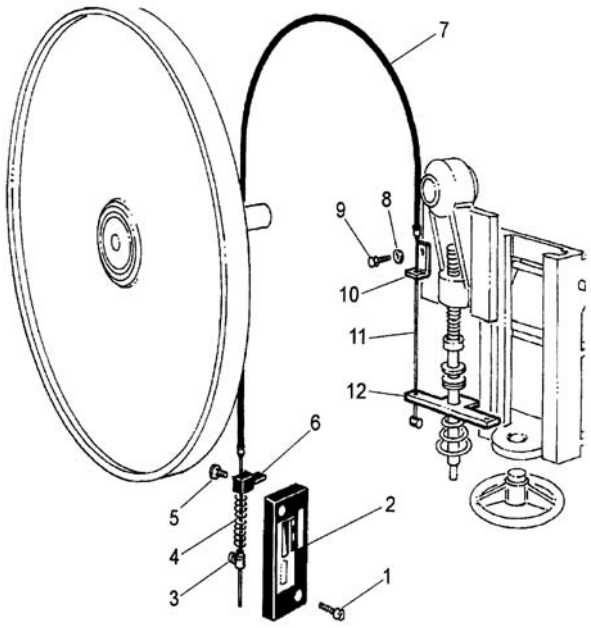


MM16, MM20

Table. 10 MM 16-20 SEE ILLUSTRATION 10 FOLLOWING

	MM 16	MM20
Ref. Nr.	CODE	CODE
1	-	-
2	48098801	48098801
3	27090000	27090000
4	30131400	30131400
5	-	-
6	48098802	48098802
7	27081500	27081500
8	-	-
9	-	-
10	48098804	48098804
11	27071300	27071300
12	48132701	48098806

PARTS ILLUSTRATION FOR TABLE 10



MM16, MM20

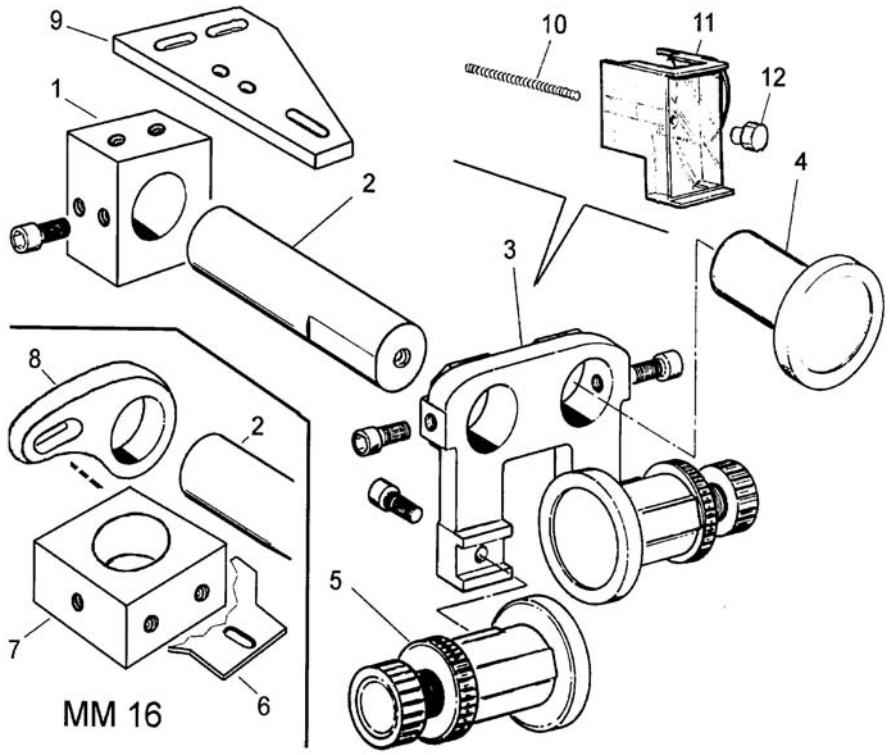
Table. 11 MM 16-20 SEE ILLUSTRATION 11 FOLLOWING

	MM 16	MM20
REFERENCE #	CODE	CODE
1	-	43050020
2	43040041	43040041
3	15	15
4	17	17
5	12	12
6	43040033	-
7	43040049	-
8	43040058	-
9	-	43050022
10	48127006	48127006
11	48127011	48127011
12	10040015	10040015
13	-	-

Table. 12 MM 16-20 SEE ILLUSTRATION 12 FOLLOWING

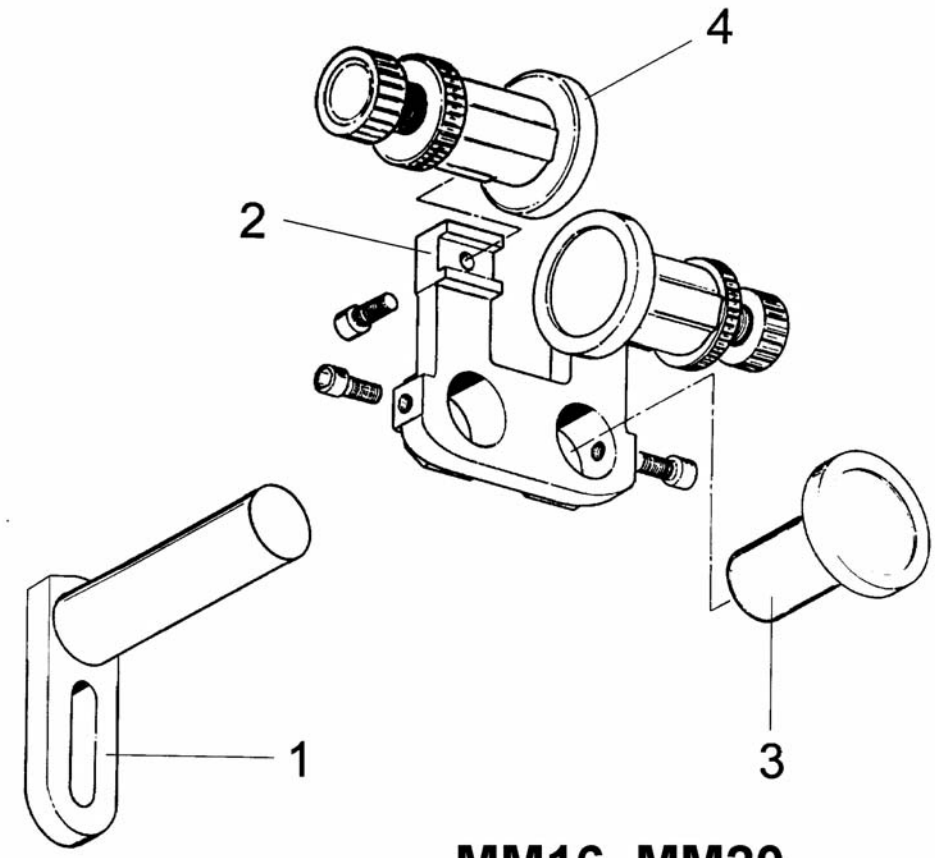
	MM 16	MM20
REFERENCE #	CODE	CODE
1	43040034	43060030
2	15	16
3	17	18
4	12	11
5		

PARTS ILLUSTRATION FOR TABLE 11



MM16, MM20

PARTS ILLUSTRATION FOR TABLE 12



MM16, MM20

NOTE THAT PARTS WITHOUT A CODE ARE NORMALLY STOCK FASTENERS OR WASHERS ETC

RECOMMENDED RESOURCES

BLADES

Olsen Blades MiniMax 1-866-975-9663
Suffolk Machinery Swedish Steel Blades 1-800-234-7297
Iturra Design - (no web site) Lenox Blades-888-722-7078
Highland Hardware - Woodslicer Blades 1-800-241-6748

TENSION GAUGES

Iturra Design (Starret, Lenox, & Iturra Blade Gage) 1-888-722-7078
Grainger (Starret) www.grainger.com

DUST COLLECTION SYSTEMS

Oneida Air systems ……. 1-800-732-4065

BOOKS

"The Art of the Bandsaw" by Mark Duginske
"Bandsaw Handbook" by Mark Duginske
"The Bandsaw Book" by Lonnie Bird

Contact MiniMax user's group www.yahoogroups.com for user friendly advice and discussions